Unraveling the structure of the photosynthetic membrane using electron microscopy approach

Arteni, Ana Andreea

References List

Abdrakhmanova, A., Zickermann, V., Bostina, M., Radermacher, M., Schägger, H., Kerscher, S., Brandt, U., Subunit composition of mitochondrial complex I from the yeast *Yarrowia lipolytica*, J. Mol. Biol., 1658 (2004) 148-156.

Adir, N., Elucidation of the molecular structures of components of the phycobilisome: reconstructing a giant, Photosynthesis Res., 85 (2005) 15-32.

Ajlani, G., Vernotte, C., Deletion in the PB-loop in the L_{CM} subunit does not affect phycobilisome assemply or energy transfer function in the cyanobacterium *Synechocystis* sp. PCC6714, Eur. J. Biochem., 257 (1998) 154-159.

Anderson, L.K., Toole, C.M., A model for early events in the assembly pathway of cyanobacterial phycobilisomes, Mol. Microbiol, 30 (1998) 467-474.

Anderson, L.K., Eiserling, F.A., Asymmetrical core structure in phycobilisomes of the cyanobacterium *Synechocystis* 6701, J. Mol. Biol., 191 (1986) 441-451.

Andrizhiyevskaya, E.G., Frolov, D., van Grondelle, R. and Dekker, J.P. Energy transfer and trapping in the Photosystem I complex of *Synechococcus* PCC 7942 and in its supercomplex with IsiA, Biochim. Biophys. Acta, 1656, (2004) 104-113.

Andrizhiyevskaya, E.G., Schwabe, T.M., Germano, M., D'Haene, S., Kruip, J., van Grondelle, R., Dekker, J.P., Spectroscopic properties of PSI-IsiA supercomplexes from the cyanobacterium *Synechococcus* PCC 7942, Biochim. Biophys. Acta, 1556 (2002) 265-272.

Angerer, A., Gaisser, S., Braun, V., Nucleotide sequences of the sfuA, sfuB, and sfuC genes of *Serratia marcescens* suggest a periplasmic-binding-protein-dependent iron transport mechanism, J Bacteriol, 172 (1990) 572-578.

Ajlani, G., Vernotte, C., DiMagno, L., Haselkorn, R., Phycobilisome core mutants of *Synechocystis* PCC 6803, Biochim. Biophys. Acta, 1231 (1995) 189-196.

Aro, E.-M., Virgin, L., Andersson, B., Photoinhibition of photosystem II. Inactivation, protein damage and turnover, Biochem. Biophys. Acta, 1143 (1993) 113-134.

Arteni, A.A., Nowaczyk, M., Lax, J., Kouřil, R., Rögner, M., Boekema, E.J., Single particle electron microscopy in combination with mass spectrometry to investigate novel complexes of membrane proteins, J. Struct. Biol., 149 (2005) 325-331.

Arteni, A.A., Liu, L.-N., Aartsma, T.J., Zhang, Y.-Z., Zhou, B.-C. and Boekema, E.J., Structure and organization of phycobilisomes on membranes of the red alga Porphyridium cruentum, Photosynthesis Res., (2007) (submitted).

Asada, K., Production and action of active oxygen species in photosynthetic tissues. In: C.H. Foyer, C. Mullineaux (ed.), Causes of Photooxidative Stress and Amelioration of Defense Systems in Plants, CRC Press, Boca Raton, U.S.A., pp. 77-104

Aspinwall, C.L., Duncan, J., Bibby, T., Mullineaux, C.W. and Barber, J., The trimeric organisation of photosystem I is not necessary for the iron-stress induced CP43' protein to functionally associate with this reaction centre, FEBS Lett., 574 (2004) 126-130.

Aspinwall, C.L., Sarcina, M., Mullineaux, C.W., Phycobilisome mobility in the cyanobacterium *Synechococcus* sp PCC7942 is influenced by the trimerisation of Photosystem I, Photosynth. Res., 79 (2004) 179-187.

Bagchi, S.N., Pistorius, E.K., Michel, K.P., A *Synechococcus* sp. PCC 7942 mutant with a higher tolerance towards bentazone, Photosynth. Res., 75 (2003) 171-182.

Bahatyrova, S., Frese, R.N., van der Werff, K.O., Otto, C., Hunter, C.N. and Olsen, J.D., Flexibility and size heterogeneity of the LH1 light harvesting complex revealed by atomic force microscopy - Functional significance for bacterial photosynthesis, J. Biol. Chem., 279 (2004) 21327-21333.

Bald, D., Kruip, J., Rögner, M., Supramolecular architecture of cyanobacterial thylakoid membranes: How is the phycobilisome connected with the photosystems?, Photosynth. Res., 49 (1996) 103-118.

Barber, J., Morris, E.P., da Fonseca, P.C.A., Interaction of the allophycocyanin core complex with photosystem II, Photochem. Photobiol. Sci., 2 (2003) 536-541.

Berger, S., Ellersiek, U. and Steinmuller, K., Cyanobacteria contain a mitochondrial complex I-homologous NADH-dehydrogenase, FEBS Lett., 286 (1991) 192-132.

Betz, M., One century of protein crystallography: the phycobiliproteins, Biol. Chem., 378 (1997) 167-176.

Bhaya, D., Schwarz, R. and Grossman, A. R.,Molecular responses to environmental stress. In: Whitton, B.A., Potts, M. (eds.) The Ecology of Cyanobacteria: their Diversity in Time and Space. Kluwer Academic Publishers, Dordrecht, London & Boston, (2000) 397-442.

Bibby, T.S., Nield, J. and Barber, J. Iron deficiency induces the formation of an antenna ring around trimeric photosystem I in cyanobacteria, Nature, 412 (2001a) 743-745.

Bibby, T.S., Nield, J. and Barber, J. Three-dimensional model and characterization of the iron stress-induced CP43'-Photosystem I supercomplex isolated from the cyanobacterium *Synechocystis* PCC 6803, J. Biol. Chem., 276 (2001b) 43246-43252.

Bibby, T.S., Nield, J., Barber, J., Three-dimensional model and characterisation of the iron-stress induced CP43'-photosystem I supercomplex isolated from the cyanobacterium *Synechocystis* PCC 6803, J. Biol. Chem., 22 (2001) 22-30.

Boekema, E.J., Hifney, A., Yakushevska, A.E., Piotrowski, M., Keegstra, W., Berry, S., Michel, K.P., Pistorius, E.K. and Kruip, J., A giant chlorophyll-protein complex induced by iron deficiency in cyanobacteria, Nature, 412 (2001) 745-748.

Boekema, E.J., van Roon, H. and Dekker, J.P., Specific association of photosystem II and light-harvesting complex II in partially solubilized photosystem II membranes, FEBS Lett., 424 (1998) 95-99.

Boekema, E.J., van Roon, H., van Breemen, J.F.L. and Dekker, J.P., Supramolecular organization of photosystem II and its light-harvesting antenna in partially solubilized membranes, Eur. J. Biochem., 266 (1999) 444-452.

Böttcher, B., Scheide, D. Hesterberg, M., Nagel-Steger, L., Friedrich, T., A novel, enzymatically active conformation of the *Escherichia coli* NADH:Ubiquinone oxidoreductase (Complex I), J. Biol. Chem., 277 (2002) 17970-17977.

Brejc, K., Ficner, R., Huber, R. & Steinbacher, S., Isolation, crystallization, crystal structure analysis and refnement of allophycocyanin from the cyanobacterium *Spirulina platensis* at 2.3 A resolution, J. Mol. Biol., 249 (1995) 424-440.

Bryant, D. A., Cyanobacterial phycobilisomes: progress toward complete structural and functional analysis via molecular genetics. In Cell Culture and Somatic Cell Genetics of Plants. The Photosynthetic Apparatus: Molecular Biology and Operation (Bogorad, L. & Vasil, I., eds), vol. 7 (1991) 257-300, Academic Press, New York.

Bryant, D. A., Guiglielmi, G., Tandeau de Marsac, N., Castets, A. & Cohen-Bazire, G., The structure of cyanobacterial phycobilisomes: a model, Arch. Microbiol., 123 (1979) 113-127.

Bryant, D. A., de Lorimier, R., Guglielmi, G. & Stevens, S. E., Jr., Structural and compositional analyses of the phycobilisomes of *Synechococcus sp. PCC 7002*. Analyses of the wild-type strain and a phycocyanin-less mutant constructed by interposon mutagenesis, Arch. Microbiol., 153 (1990) 550-560.

Büchel, C., Morris, E., Orlova, E., Barber, J., Localisation of the PsbH subunit in photosystem II: a new approach using labelling of His-tags with a Ni(2+)-NTA gold cluster and single particle analysis, J. Mol. Biol., 312 (2001) 371-379.

Büchel, C., Kühlbrandt, W., Structural differences in the inner part of Photosystem II between higher plants and cyanobacterial, Photosynth. Res., 85 (2005) 3-13.

Burnap, R.L., Troyan, T., Sherman, L.A., The highly abundant chlorophyll-protein complex of iron-deficient *Synechococcus* sp. PCC 7942 (CP43') is encoded by the isiA gene, Plant Physio.l, 103 (1993) 893-902.

Cadoret, J.C., Demoulière, R., Lavaud, J., van Gorkom, H.J., Houmard, J. and Etienne, A.L., Dissipation of excess energy triggered by blue light in cyanobacteria with CP43' (isiA), Biochim. Biophys. Acta, 1659 (2004) 100-104.

Clement-Metral, J., Gantt, E., Isolation of oxygen-evolving phycobilisome-photosystem II particles from *Porphyridium cruentum*, FEBS Lett., 156 (1983) 185-188.

Cunningham, F.X., Dennenberg, R.J., Mustardy, L., Jursinic, P.A., Gantt, E., Stoichiometry of Photosystem I, Photosystem II, and phycobilisomes in the red alga *Porphyridium cruentum* as a function of growth irradiance, Plant Physiol., 91 (1989) 1179-1187.

De Lorimier, R., Bryant, D. A. & Stevens, S. E., Jr., Genetic analysis of a 9 kDa phycocyaninassociated linker polypeptide, Biochim. Biophys. Acta, 1019 (1990) 29-41.

Dekker, J.P. and Boekema, E.J., Supramolecular organization of thylakoid membrane proteins in green plants, Biochim. Biophys. Acta, 1706 (2005) 12-39.

Dekker, J.P., van Roon H. and Boekema, E.J., Heptameric association of light-harvesting complex II trimers in partially solubilized photosystem II membranes., FEBS Lett., 449 (1999) 211-214.

Diner, B. A., Babcock, G. T., Oxigenic photosynthesis: the light reaction, Kluwer, (1996) 137-164.

Djafarzadeh, R., Kerscher, S., Zwicker, K., Radermacher, M., Lindahl, M., Schägger, H., Brandt, U., Biophysical and structural characterization of proton-translocating NADH-dehydrogenase (complex I) from the strictly aerobic yeast *Yarrowia lipolytica*, Biochim. Biophys. Acta, 1459 (2000) 230-238.

Downs, C.A., Coleman, J.S., Heckathorn, S.A., The chloroplast 22-Ku heat-shock protein: A lumenal protein that associates with the oxygen evolving complex and protects photosystem II during heat stress, J. Plant Physiol., 155 (1999) 477-487.

Downs, C.A., Ryan, S.A., Heckathorn, S.A., The chloroplast small heat-shock protein: Evidence for a general role in protecting photosystem II against oxidative stress and photoinhibition, J. Plant Physiol., 155 (1999) 488-496.

Ducret, A., Sidler, W., Wehrli, E., Frank, G. & Zuber, H., Isolation, characterization and electron microscopy analysis of a hemidiscoidal phycobilisome type from the cyanobacterium *Anabaena* sp. PCC 7120, Eur. J. Biochem., 236 (1996) 1010-1024.

Dudkina, N.V., Eubel, H., Keegstra, W., Boekema, E.J., Braun, H.P., Structure of a mitochondrial supercomplex formed by respiratory-chain complexes I and III, Proc. Natl. Acad. Sci., 102 (2005) 3225-3229.

Duerring, M., Huber, R., Bode, W., Ruembeli, R. & Zuber, H., Refined three-dimensional structure of phycoerythrocyanin from the cyanobacterium *Mastigocladus laminosus* at 2.7 A, J. Mol. Biol., 211 (1990) 633-644.

Dupuis, A., Prieur, I. and Lunardi, J., Toward a characterization of the connecting module of Complex I, J. Bioenerg. Biomembr., 33 (2001) 159-168.

Edwards, M. R., Gantt, E.: Phycobilisomes of the thermophilic blue-green alga *Synechococcus lividus*, J. Cell Biol., 50 (1971) 896–900.

Elmorjani, K., Thomas, J.C., Sebban, P., Phycobilisomes of wild-type and pigment mutants of the cyanobacterium *Synechocystis* PCC 6803, Arch. of Microbiol, 146 (2) (1986) 186-191.

Everberg, H., Sivars, U., Emanuelsson, C., Persson, C., Englund, A.K., Haneskog, L., Lipniunas, P., Jornten-Karlsson, M. and Tjerneld F., Protein pre-fractionation in detergent-polymer aqueous two-phase systems for facilitated proteomic studies of membrane proteins, J. Chromatogr. A., 1029 (2004) 113-24.

Exss-Sonne, P., Tölle, J., Bader, K.P., Pistorius, E.K., Michel, K.P., The IdiA protein of *Synechococcus* sp. PCC 7942 functions in protecting photosystem II under oxidative stress, Photosynth. Res., 63 (2000) 145-157.

Falk, S., Samson, G., Bruce, D. and Huner, N.P.A., Functional analysis of the iron-stress induced CP43' polypeptide of PS II in the cyanobacterium *Synechococcus* sp. PCC 7942, Photosynth. Res., 45 (1995) 51-60.

Ferreiros, C., Criado, M.T., Gomez, G.A., The neisserial 37 kDa ferric binding protein (FbpA), Comp. Biochem. Physiol. B. Biochem. Mol. Biol., 123 (1999) 1-7.

Ferreira, K.N., Iverson, T.M., Maghlaoui, K., Barber, J. and Iwata, S. Science, Architecture of the photosynthetic oxygen-evolving center, Science, 303 (2004) 1831-1838.

Ficner, R., Lobeck, K., Schimdt, G. & Huber, R., Isolation, crystallization, crystal structure analysis and refinement of B-phycoerythrin from the red alga *Porphyridium sordidum* at 2.2 A resolution, J. Mol. Biol., 228 (1992) 935-950.

Fonseca, P., Morris, E. P., Hankamer, B., Barber, J., Electron crystallographic study of photosystem II of the cyanobacterium *Synecococcuc elongatus*, Biochemistry, 41 (2002) 5163-5167.

Frank, J., Single-particle imaging of macromolecules by cryo-electron microscopy, Annu. Rev. Biophys. Biomol. Struct., 31 (2002) 309-319.

Frausto da Silva, J. J. R. and Williams, R. J. P.,The Biological Chemistry of the Elements. The Inorganic Chemistry of Life, Clarendon Press, Oxford, (1993) 370-387.

Friedrich, T., Steinmüller, K., Weiss, H., The proton pumping respiratory complex I of bacteria and mitochondria and its homologue in chloroplasts, FEBS Lett., 367 (1995) 107-111.

Fromme, P., Melkozernov, A., Jordan, J. and Krauss, N., Structure and function of photosystem I: interaction with its soluble electron carriers and external antenna systems, FEBS Lett., 555 (2003) 40-44.

Gantt, E., Structure and function of phycobilisomes: light harvesting pigment complexes in red and blue-green algae, Int. Rev. Cytol., 66 (1980) 45-80.

Gantt, E., Conti, S. F.: Phycobiliprotein localization in algae, Brookhaven Symp. Biol., 19 (1966) 393–405.

Gantt, E., Phycobilisomes, In Staehelin LA, Anderson JM,Arntzen CJ (Eds), Photosynthesis III: Photosenthetic Membranes and Light Harvesting Systems. Springer, (1986) pp. 260-268.

Gantt, E., Conti, S.F., Granules associated with the chloroplast lamellae of *Porphyridium cruentum*, J. Cell. Biol., 29 (1966) 423-434.

Gantt, E., Grabowski, B., Cunningham, F.X. Jr., Antenna systems of red algae: phycobilisomes with Photosystem II and chlorophyll complexes with Photosystem I, In Green BR, Parson WW (Eds), Light-Harvesting Antennas in Photosynthesis, Kluwer Academic Publishers, Netherlands, (2003) pp 307-322.

Gantt, E., Lipschultz, C.A., Zilinskas, B., Further evidence for a phycobilisome model from selective dissociation, fluorescence emission, immunoprecipitation, and electron microscopy, Biochim. Biophys. Acta, 430 (1976) 375-388.

Gantt, E., Lipschultz, C,A., Phycobilisomes of *Porphyridium cruentum*. Isolation, J. Cell. Biol., 54 (1972) 313-24.

Gardian, Z., Bumba, L., Schrofel, A., Herbstova, M., Nebesarova, J., Vacha, F., Organisation of Photosystem I and Photosystem II in red alga *Cyanidium caldarium*: encounter of cyanobacterial and higher plant concepts, Biochim. Biophys. Acta, 1767 (2007) 725-731.

Glauser, M., Bryant, D. A., Frank, G., Wehrli, E., Rusconi, S. S., Sidler, W. & Zuber, H., Phycobilisome structure in the cyanobacteria *Mastigocladus laminosus* and Anabaena sp. PCC 7120, Eur. J. Biochem., 205 (1992) 907-915.

Glazer, A. N., Phycobilisomes: assembly and attachment. In The Cyanobacteria (Fay, P. & Van Baalen, C., eds), (1987) 69-88, Elsevier Biomedical, Amsterdam.

Glazer, A. N., Light guides, J. Biol. Chem., 264 (1989) 1-4.

Glazer, A.N., Phycobilisomes, In Packer L and Glazer AN (Eds) Methods in Enzymology. Academic Press, San Diego, (1988) pp 304-312.

Glazer, A.N., Williams, R.C., Yamanaka, G., Schachman, H.K., Characterization of cyanobacterial phycobilisomes in zwitterionic detergents, Proc. Natl. Acad. Sci. U S A, 76 (1979) 6162-6166.

Gómez-Lojero, C., Pérez-Gómez, B., Shen, G., Schluchter, W.M., Bryant, D.A., Interaction of ferredoxin:NADP+ oxidoreductase with phycobilisomes and phycobilisome substructures of the cyanobacterium *Synechococcus* sp. strain PCC 7002, Biochemistry, 42 (2003) 13800-13811.

Grigorieff, N., Three-dimensional Structure of Bovine NADH:Ubiquinone Oxidoreductase (Complex I) at 22 Å in Ice, J. Mol. Biol., 277 (1998) 1033-1046.

Grossman, A.R., Bhaya, D., Apt, K.E., Kehoe, D.M., Light-harvesting complexes in oxygenic photosynthesis: diversity, control, and evolution, Annu. Rev. Genet., 29 (1995) 231-288.

Grossman, A.R., Schaefer, M.R., Chiang, G.G., Collier, J.L., The phycobilisome, a light-harvesting complex responsive to environmental conditions, Microbiol. Rev., 57 (1993) 725–749.

Guenebaut, V., Vincentelli, R., Mills, D., Weiss, H., Leonard, K.R., Three-dimensional Structure of NADH-dehydrogenase from *Neurospora crassa* by Electron Microscopy and Conical Tilt Reconstitution, J. Mol. Biol., 265 (1997) 409-418.

Guikema, J.A. and Sherman, L.A., Organization and function of chlorophyll in membranes of cyanobacteria during iron starvation, Plant Physiol., 73 (1983) 250-256.

Guikema, J.A. and Sherman, L.A., Influence of iron deprivation on the membrane composition of *Anacystis nidulans*, Plant Physiol., 74 (1984) 90-95.

Guglielmi, G., Cohen-Bazire, G., Taxonomic study of a cyanobacterial genus belonging to Oscillatoriaceae: the genus *Pseudanabaena lauterborn* II. Molecular composition and structure of the phycobilisomes, Protistologica, 20 (1984) 393-413.

Guglielmi, G., Cohen-Bazire, G., and Bryant, D.A., The structure of *Gleobacter violaceus* and its phycobilisome, Arch. Microbiol., 129 (1981) 181-189.

Hankamer, B., Barber, J. and Boekema, E.J., Structure and membrane organization of Photosystem II in green plants, Ann. Rev. Plant Physiol. Plant Mol. Biol., 48 (1997) 641–671.

Hankamer, B., Morris E., Nield, J.,Carne, A., Barber, J., Subunit positioning and transmembrane helix organisation in the , core dimer of photosystem II, FEBS Letters, 504 (2001) 142-151.

Harauz, G., Boekema, E.J., van Heel, M., Statistical anaylsis of electron micrographs of ribosomal subunits, Methods in Enzymol., 164 (1988) 35-49.

Hardie, L. P., Balkwill, D. L. and Stevens, S. E., Effects of iron starvation on the physiology of the cyanobacterium Agmenellum quadruplicatum, Appl. Environ. Microbiol., 45 (1983) 999-1006.

Havaux, M., Guedeney, G., Hagemann, H., Yeremenko, N., Matthijs, H.C., Jeanjean, R., The chlorophyll-binding protein IsiA is inducible by high light and protects the cyanobacterium *Synechocystis* PCC6803 from photooxidative stress, FEBS Lett., 579 (2005) 2289-2293.

Helmann, J.D., Metal cation regulation in Gram-positive bacteria. In: S. Silver, W. Walden (ed.), Metal Ions in Gene Regulation, International Thomson Publishing, New York, U.S.A., pp. 45-76.

Herranen, M., Battchikova, N., Zhang, P., Graf, A., Sirpio, S., Paakkarinen, V., Aro, E.-M., Towards Functional Proteomics of Membrane Protein Complexes in *Synechocystis* sp. PCC 6803, Plant Physiol., 134 (2004) 470-481.

Hofhaus, G., Weiss, H., Leonard, K., Electron Microscopic Analysis of the Peripheral and Membrane Parts of Mitochondrial NADH Dehydrogenase (Complex I), J. Mol. Biol., 221 (1991) 1027-1043.

Holzwarth, A.R., Muller, M.G., Reus, M., Nowaczyk, M., Sander, J., Rogner, M., Kinetics and mechanism of electron transfer in intact photosystem II and in the isolated reaction center: pheophytin is the primary electron acceptor, Proc. Natl. Acad. Sci. USA, 103 (2006) 6895-6900.

Isono, T. & Katoh, T., Subparticles of Anabaena phycobilisomes I. Reconstitution of allophycocyanin cores and entire phycobilisomes, Plant Cell Physiol., 24 (1983) 357-368.

Isono, T. & Katoh, T., Subparticles of Anabaena phycobilisomes II. Molecular assembly of allophycocyanin cores in reference to ``anchor'' protein, Arch. Biochem. Biophys., 256 (1987) 317-324.

Ivanov, A.G., Park, Y.I., Miskiewicz, E., Raven, J.A., Huner, N.P.A. and Öquist, G., Iron stress restricts photosynthetic intersystem electron transport in *Synechococcus* sp. PCC 7942, FEBS Lett., 485 (2000) 173-177.

Jahn, W., Steinbiss, J., Zetsche, K., Light intensity adaptation of the phycobiliprotein content of the red alga *Porphyridium*, Planta, 161 (1984) 536-539.

Jeanjean, R., Zuther, E., Yeremenko, N., Havaux, M., Matthijs, H.C.P. and Hagemann, M., A photosystem 1 psaFJ-null mutant of the cyanobacterium *Synechocystis* PCC 6803 expresses the isiAB operon under iron replete conditions, FEBS Lett., 549 (2003) 52-56.

Jordan, P., Fromme, P., Witt, H.T., Kuklas, O., Saenger, W. and Krauss, N., Three-dimensional structure of cyanobacterial photosystem I at 2.5 Å resolution, Nature, 411 (2001) 909-917.

Joshua, S., Bailey, S., Mann, N.H., Mullineaux, C.W., Involvement of Phycobilisome Diffusion in Energy Quenching in Cyanobacteria, Plant Physiol., 138 (2005) 1577-1585.

Jürgens, U. J. and Weckesser, J., The fine structure and chemical composition of the cell wall and sheath layers of cyanobacteria, Ann. Inst. Pasteur Microbiol., 136 (1985) 41-46.

Kamiya, N., Shen, J.R., Crystal structure of oxygen-evolving photosystem II from Thermosynechococcus vulcanus at 3.7-angstrom resolution, Proc. Natl. Acad. Sci. USA, 100 (2003) 98-103.

Kaneko, T., Sato, S., Kotani, H., Tanaka, A., Asamizu, E., Nakamura, Y., Miyajima, N., Hirosawa, M., Sugiura, M., Sasamoto, S., Kimura, T., Hosouchi, T., Matsuno, A., Muraki, A., Nakazaki, N., Naruo, K., Okumura, S., Shimpo, S., Takeuchi, C., Wada, T., Watanabe, A., Yamada, M., Yasuda, M. and Tabata, S., Sequence analysis of the genome of the unicellular cyanobacterium *Synechocystis* sp. strain PCC6803. II. Sequence determination of the entire genome and assignment of potential protein-coding regions, DNA Res., 3 (1996) 109-36.

Kaplan A., and Reinhold, L., CO_2 concentrating mechanisms in photosynthetic microorganisms, Ann. Rev. Plant Physiol. Mol. Biol., 50 (1999) 539-570.

Kashino, Y., Koile, H., Yoshio, M., Egashira, H., Ikeuchi, M., Pakrasi, H. B., Satoh, K., Low-Molecular-Mass Polypeptide Components of a Photosystem II preparation from *Thermosynechococcus vulcanis*, Plant&Cell Physiology, 43 (2002) 1366-1373.

Katoh, H., Grossman, A.R., Hagino, N., Ogawa, T., A Gene of *Synechocystis* sp. strain PCC 6803 Encoding a Novel Iron Transporter, J. Bacteriol., 182 (2000) 6523-6524.

Katoh, H., Hagino, N., Grossman, A.R., Ogawa, T., Genes essential to iron transport in the cyanobacterium *Synechocystis* sp. strain PCC 6803, J. Bacteriol., 183 (2001) 2779-2784.

Katoh, H., Hagino, N., Ogawa, T., Iron-binding of FutA1 subunit of an ABC-type iron transporter in the cyanobacterium *Synechocystis* sp. strain PCC 6803, Plant Cell Physiol., 42 (2001) 823-827.

Kirby, S., Lainson, F., Donachie, W., Okabe, A., Tokuda, M., Hatase, O., Schryvers, A., The Pasteurella haemolytica 35 kDa iron-regulated protein is an FbpA homologue, Microbiology, 144 (1998) 3425-3436.

Klughammer, B., Sultemeyer, D., Badger, M.R., Price, G.D., The involvement of NAD(P)H dehydrogenase subunits, NdhD3 and NdhF3, in high-affinity CO2 uptake in *Synechococcus* sp. PCC7002 gives evidence for multiple NDH-1 complexes with specific roles in cyanobacteria, Mol. Microbiol., 32 (1999) 1305-1315.

Kotani, H, Tabata, S., Lessons from sequencing of the genome of a unicellular cyanobacterium, *Synechocystis* Sp. PC6803, Annu. Rev. Plant Physiol. Plant Mol. Biol., 49 (1998) 151-171.

Kouril, R., Arteni, A.A., Lax, J., Yeremenko, N., D'Haene, S., Rogner, M., Matthijs, H.C., Dekker, J.P., Boekema, E.J., Structure and functional role of supercomplexes of IsiA and Photosystem I in cyanobacterial photosynthesis, FEBS Lett., 579 (2005) 3253-3257.

Kouřil, R., Yeremenko, N., D'Haene, S., Oostergetel, G.T., Matthijs, H.C.P., Dekker, J.P. and Boekema, E.J., Supercomplexes of IsiA and Photosystem I in a mutant lacking subunit PsaL, Biochim. Biophys. Acta, 1706 (2005) 262-266.

Kouřil, R., Yeremenko, N., D'Haene, S., Yakushevska, A.E., Keegstra, W., Matthijs, H.C.P., Dekker, J.P. and Boekema, E.J., Photosystem I trimers from *Synechococcus* sp. PCC6803 lacking the PsaF and PsaJ subunits bind an IsiA ring of 17 units, Biochim. Biophys., Acta 1607 (2003) 1-4.

Krogmann, D.W., Pérez-Gómez, B., Gutiérrez-Cirlos, E.B., Chagolla-López, A., González de la Vara, L., Gómez-Lojero, C., The presence of multidomain linkers determines the bundle-shape structure of the phycobilisome of the cyanobacterium Gloeobacter violaceus PCC 7421, Photosynth Res., [Epub ahead of print], 2007.

Kuhl, H., Kruip, J., Seidler, A., Krieger-Liszkay, A., Bunker, M., Bald, D., Scheidig, A.G., Rogner, M., Towards structural determination of the water-splitting enzyme. Purification, crystallization, and preliminary crystallographic studies of photosystem II from a thermophilic cyanobacterium, J. Biol. Chem., 275 (2000) 20652-20659.

Kuhl, H., Rögner, M., van Breemen, J.F.L. and Boekema, E.J., Localization of cyanobacterial PS II donor-side subunits by electron microscopy and the supramolecular organization of PS II in the thylakoid membrane, Eur. J. Biochem., 266 (1999) 453-460.

Kühlbrandt, W., Wang, D. N. and Fujiyoshi, Y., Atomic model of plant light-harvesting complex by electron microscopy. Nature, 367 (1994) 614-621.

Latifi, A., Jeanjean, R., Lemeille, S., Havaux, M., Zhang, C.C., Iron starvation leads to oxidative stress in *Anabaena* sp. strain PCC 7120, J. Bacteriol., 187 (2005) 6596-6598.

Laudenbach, D.E., Straus, N.A., Characterization of a cyanobacterial iron stress-induced gene similar to psbC, J. Bacteriol., 170 (1988) 5018-5026.

Li, H., Li, D.H., Yang, S.Z., Xie, H., Zhao, J.Q., The state transition mechanism - simply depending on light-on and -off in Spirulina platensis, Biochim. Biophys. Acta, 1757 (2006) 1512-1519.

Lichtlé, C., Thomas, J. C.: Etude ultrastructurale des thylacoides des algues à phycobiliproteines, comparison des résultats obtenus par fixation classique et cryodécapage, Phycologia, 15 (1976) 393–404.

Lippard, S. J. and Berg, J. M., Control and Utilization of Metal-Ion Concentrations in Cells, In: Principles of Bioorganic Chemistry. University Science Books, Mill Valley, California (1994).

Liu, J.Y., Jiang, T., Zhang, J.P., Liang, D.C., Crystal structure of allophycocianin from red algae *Porphyra yezoensis*, J. Biol. Chem., 274 (4) (1999)16945-52.

Liu, L.N., Chen, X.L., Zhang, Y.Z., Zhou, B.C., Characterization, structure and function of linker polypeptides in phycobilisomes of cyanobacteria and red algae: an overview, Biochim. Biophys. Acta, 1708 (2005) 133-142.

Loll, B., Kern, J., Saenger, W., Zouni, A., Biesiadka, J., Towards complete cofactor arrangement in the 3.0 A resolution structure of photosystem II, Nature, 438 (2005) 1040-4.

Loll, B., Kern, J., Saenger, W., Zouni, A., Biesiadka, J., Lipids in photosystem II: Interactions with proteins and cofactors, Biochim. Biophys. Acta., (2007) 1767, 509-519.

Ludtke, S.J., Chen, D.-H., Song, J.-L., Chuang, D.T. and Chiu, W., Seeing GroEL at 6 Å resolution by single particle electron cryomicroscopy, Structure, 12 (2004) 1129-1136.

Lundell, D.J., Glazer, A.N, Molecular architecture of a light-harvesting antenna. Quaternary interactions in the *Synechococcus* 6301 phycobilisome core as revealed by partial tryptic digestion and circular dichroism studies, J. Biol. Chem., 258 (1983) 894-901.

Lundrigan, M. D., Arceneaux, J. E. L., Zhu, W. and Byers, B. R., Enhanced hydrogen peroxide sensitivity and altered stress protein expression in iron-starved Mycobacterium smegmatis, Biometals., 10 (1997) 215-225.

MacColl, R., Cyanobacterial phycobilisomes, J. Struct. Biol., 124 (1998) 311-334.

Maeda, S., Badger, M.R., Price, G.D., Novel gene products associated with NdhD3/D4-containing NDH-1 complexes are involved in photosynthetic CO_2 hydration in the cyanobacterium *Synechococcus* sp PCC7942, Mol. Microbiol., 43 (2002) 425-435.

Mangels, D., Kruip, J., Berry, S., Rögner, M., Boekema, E.J. and König, F., Photosystem I from the unusual cyanobacterium *Gloeobacter violaceus*. Photosynthesis Res. 72, (2002) 307-319.

Melkozernov, A.N., Bibby, T.S., Lin, S., Barber, J., Blankenship, R.E., Time-resolved absorption and emission show that the CP43' antenna ring of iron-stressed *Synechocystis* sp. PCC6803 is efficiently coupled to the photosystem I reaction center core, Biochemistry, 42 (2003) 3893-3903.

Mi, H., Endo, T., Schreiber, U., Ogawa, T., Asada, K., Electron donation from cyclic and respiratory flows to the photosynthetic intersystem chain is mediated by pyridine nucleotide dehydrogenase in the cyanobacterium *Synechocystis* PCC 6803, Plant Cell Physiol., 33 (1992) 1233-1237.

Mi, H., Endo, T. Ogawa, T., Asada, K., Thylakoid membrane-bound, NADPH-specific pyridine-nucleotide dehydrogenase complex mediates cyclic electron-transport in the cyanobacterium *Synechocystis* SP PCC-68038, Plant Cell Physiol., 36 (1995) 661-668.

Michel, H.P., Pistorius, E.K., Golden, S.S., Unusual regulatory elements for iron deficiency induction of the idiA gene of *Synechococcus elongatus* PCC 7942, J. Bacteriol, 183 (2001) 5015-5024.

Michel, K.P. and Pistorius, E.K., Adaptation of the photosynthetic electron transport chain in cyanobacteria to iron deficiency: The function of IdiA and IsiA. Physiol. Plant., 120 (2004) 36-50.

Michel, K.P., Exss-Sonne, P., Scholten-Beck, G., Kahmann, U., Ruppel, H.G., Pistorius, E.K., Immunocytochemical localization of IdiA, a protein expressed under iron or manganese limitation in the mesophilic cyanobacterium Synechococcus PCC 6301 and the thermophilic cyanobacterium *Synechococcus elongatus*, Planta, 205 (1998) 73-81.

Michel, K.P., Molekularbiologische Untersuchungen des für die Eisen- und Manganversorgung der Cyanobakterien *Synechococcus* PCC 6301 und PCC 7942 essentiellen Proteins IdiA; regular, Universität Bielefeld, Bielefeld, (1996), pp. 198.

Michel, K.P., Pistorius, E.K., Isolation of a photosystem II associated 36 kDa polypeptide and an iron stress 34 kDa polypeptide from thylakoid membranes of the cyanobacterium *Synechococcus* PCC 6301 grown under mild iron deficiency, Z Naturforsch [C], 47 (1992) 867-874.

Michel, K.P., Thole, H.H., Pistorius, E.K., IdiA, a 34 kDa protein in the cyanobacteria *Synechococcus* sp. strains PCC 6301 and PCC 7942, is required for growth under iron and manganese limitations, Microbiology, 142 (1996) 2635-2645.

Mittler, R., Oxidative stress, antioxidants and stress tolerance, Trends Plant Sci., 7 (2002) 405-410.

Mörchel, E., Schatz, G.H., Correlation of photosystem II complexes with exoplasmatic freeze-fracture particles of thylakoids of the cyanobacterium *Synechococcus* sp., Planta, 172 (1987) 145-154.

Mörchel, E., Muhlethaler, K., On the linkage of exoplasmatic freeze-fracture particles phycobilisomes, Planta, 158 (1983) 451-457

Morschel, E., Koller, K.-P., Wehrmeyer, W. & Schneider, H., Biliprotein assembly in the disc-shaped phycobilisomes of *Rhodella viohwea.* I. Electron microscopy of phycobilisomes in situ and analysis of heir architecture after isolation and negative staining, Cytobiol., 16 (1977) 118-129.

Morschel, E., Koller, K.-P. & Wehrmeyer, W., Biliprotein assembly in the disc-shaped phycobilisomes of *Rhodella violacea.* Electron microscopical and

biochemical analysis of C-phycocyanin and allophycocyanin aggregates, Arch. Microbiol., 125 (1980) 43-51.

Mullineaux, C.W., Tobin, M.J., Jones, G.R., Mobility of photosynthetic complexes in thylakoid membranes, Nature, 390 (1997) 421-424

Murata, N. and Omata, T., Isolation of cyanobacterial plasmamembranes, Methods Enzymol., 167 (1988) 245-251.

Nakamura, Y., Kaneko, T., Sato, S., Ikeuchi, M., Katoh, H., Sasamoto, S., Watanabe, A., Iriguchi, M., Kawashima, K., Kimura, T., Kishida, Y., Kiyokawa, C., Kohara, M., Matsumoto, M., Matsuno, A., Nakazaki, N., Shimpo, S., Sugimoto, M., Takeuchi, C., Yamada, M. and Tabata, S., Complete genome structure of the thermophilic cyanobacterium *Thermosynechococcus elongatus* BP- 1 (supplement), DNA Res., 9 (2002) 135-48.

Nield, J., Morris, E.P., Bibby, T.S., Barber, J., Structural analysis of the photosystem I supercomplex of cyanobacteria induced by iron deficiency, Biochemistry, 42 (2003) 3180-3188.

Nield, J., Rizkallah, P.J., Barber, J., Chayes, N.E., The 1.45 A three-dimensional structure of C-phycocyanin from the thermophilic cyanobacterium Synechococcus elongatus, J. Struct. Biol., 141(2) (2003) 149-155.

Nilsson, F., Simpson, D.J., Jansson, C., Andersson, B., Ultrastructural and biochemical characterisation of a Synechocystis 6803 mutant with inactivated psbA genes, Arch. Biochem, Biophys., 295 (1992) 340–347.

Nowaczyk, M., Hebeler, R., Schlodder, E., Meyer, H.E., Warscheid, B., Rögner, M., Psb27, a cyanobacterial lipoprotein involved in the repair cycle of photosystem II, Plant Cell, (2006) in press.

Ogawa, T., Kaplan, A., Inorganic carbon acquisition systems in cyanobacteria, Photosynthesis Res., 77 (2003) 105-115.

Ohkawa, H., Pakrasi, H.B., Ogawa, T., Two types of functionally distinct NAD(P)H dehydrogenases in *Synechocystis* sp. Strain PCC6803, J. Biol. Chem., 275 (2000) 31630-31634.
Ohkawa, H., Sonade, M., Katoh, H., Ogawa, T., The use of mutants in the analysis of the CO_2- concentrating mechanism in cyanobacteria, Can. J. Bot., 76 (1998) 1035-1042.

Olive, J., Ajlani, G., Astier, C., Recouvreur, M., Vernotte, C., Ultrastructure and light adaptation of phycobilisome mutants of *Synechosystis* PCC 6803, Biochemica et Biophysica Acta, 1319 (1997) 275-282.

Omata, T. and Murata, N., Isolation and characterization of three types of membranes from the cyanobacterium (blue green algae) *Synechocystis* PCC 6714, Arch Microbiol., 139 (1984) 113-116.

Omata, T., Price, G.D., Badger, M.R., Okamura, M., Gohta, G., Ogawa, T., Identification of an ATP-binding cassette transporter involved in bicarbonate uptake in the cyanobacterium *Synechococcus* sp strain PCC7942, Proc. Natl. Acad. Sci. USA, 96 (1999) 13571-13576.

Öquist, G., Iron deficiency in the blue-green algae *Anacystis nidulans*, Physiol. Plant, 30 (1974) 30-37.

Pakrasi, H.B., Riethman, H.C. and Sherman, L.A., Organization of pigment proteins in the photosystem II complex of the cyanobacterium *Anacystis nidulans* R2, Proc. Natl. Acad. Sci. USA, 82 (1985) 6903-6907.

Park, Y.I., Sandström, S., Gustafsson, P. and Öquist, G., Expression of the isiA gene is essential for the survival of the cyanobacterium *Synechococcus* sp. PCC 7942 by protecting photosystem II from excess light under iron limitation, Mol. Microbiol., 32 (1999) 123-129.

Penczek, P., Radermacher, M., Frank, J., Three-dimensional reconstruction of single particles embedded in ice, Ultramicroscopy, 40 (1992) 33-53.

Peng, G., Fritzch, G., Zickermann, V., Schägger, H., Mentele, R., Lottspeich, F., Bostina, M., Radermacher, M., Huber, R., Stetter K.O., and Michel, H., Isolation, characterization and electron microscopic single particle analysis of the NADH: Ubiquinone (ComplexI) from the hyperthermophilic eubacterium *Aquifex aeolicus*, Biochemistry, 42 (2003) 3032-3039.

Price, G.D., Sültemeyer, D., Klughammer, B., Ludwig, M., Badger, M.R., The functioning of the CO_2 converting mechanism in several cyanobacterial strains: a review of general physiological characteristics, genes, proteins and recent advances, Can. J. Bot., 76 (1998) 973-1002.

Prommeenate, P., Lennon, A.M., Markert, C., Hippler, M., Nixon, P.J., Subunit composition of NDH-1 complexes of *Synechocystis* sp. PCC 6803: identification of two new ndh gene products with nuclear-encoded homologues in the chloroplast Ndh complex, J. Biol. Chem., 279 (2004) 28165-28173.

Raven, J.A., Evans, M.C.W. and Korb, R.E., The role of trace metals in photosynthetic electron transport in O_2-evolving organisms, Photosynth. Res., 60 (1999) 111-149.

Redecker, D., Wehrmeyer, W., Reuter, W., Core substructure of the hemiellipoidal phycobilisomes of the red alga *Porhyridium cruentum*, Eur. J. Cell Biol., 62 (1993) 442-450.

Redecker, D., Wehrmeyer, W., Reuter, W., Core substructure of the hemiellipsoidal phycobilisome from the red alga *Porphyridium cruentum*, Eur. J. Cell. Biol., 62 (1993) 442-450.

Riethman, H. C. and Sherman, L. A., Regulation of cyanobacterial pigment-protein composition and organization by environmental factors, Photosynth. Res., 18 (1988) 133-161.

Riethman, H.C., Sherman, D., Immunological characterization of iron-regulated membrane proteins in the cyanobacterium *Anacystis nidulans* R2, Plant Physiol, 88 (1988) 497-505.

Rippka, R., Waterbury, J. and Cohen-Bazire, G., A cyanobacterium which lacks thylakoids, Arch. Microbiol., 100 (1974) 419-436.

Rögner, M., Boekema, E.J., Barber, J., How does photosystem 2 split water? The structural basis of efficient energy conversion, Trends Biochem. Sci., 21 (1996) 44-49.

Samsonoff, W.A., MacColl, R.,Biliproteins and phycobilisomes from cyanobacteria and red algae at the extremes of habitat, Arch. Microbiol., 176 (2001) 400-405.

Sanders, J.D. Cope, L.D., Hansen, E.J., Identification of a locus involved in the utilization of iron by Haemophilus influenzae, Infect Immun, 62 (1994) 4515-4525.

Sandmann, G., Consequences of iron deficiency on photosynthetic and respiratory electron transport in blue-green algae, Photosynth. Res., 6 (1985) 261-271.

Sandström, S., Ivanov, A.G., Park, Y.I., Öquist, G., Gustafsson, P., Iron stress responses in the cyanobacterium *Synechococcus* sp. PCC7942, Physiol. Plant, 116 (2002) 255-263.

Sandström, S., Park, Y.I., Öquist, G. and Gustafsson, P., CP43', the isiA gene product, functions as an excitation energy dissipator in the cyanobacterium *Synechococcus* sp. PCC 7942, Photochem. Photobiol., 74 (2001) 431-437.

Sarcina, M. and Mullineaux, C.W., Mobility of the IsiA chlorophyll-binding protein in cyanobacterial thylakoid membranes, J. Biol. Chem., 279 (2004) 36514-36518.

Sarcina, M., Tobin, M.J., Mullineaux, C.W., Diffusion of phycobilisomes on the thylakoid membranes of the cyanobacterium Synechococcus 7942. Effects of phycobilisome size, temperature and membrane lipid composition, J, Biol, Chem., 276 (2001) 46830–46834.

Schaegger, H., von Jagow, G., Tricine-sodium dodecylsulphate-polyacrylamide gel electrophoresis for the separation of proteins in the range from 1 to 100 kDa, Anal. Biochem., 166 (1987) 368-379.

Schirmer, T., Bode, W., Huber, R., Sidler, W. & Zuber, H., X-ray crystallographic structure of the light-harvesting biliprotein C-phycocyanin from the thermophilic cyanobacterium *Mastigocladus huninosus* and its resemblance to globin structures, J. Mol. Biol., 184 (1985) 257-277.

Schirmer, T., Bode, W. & Huber, R., Refined three-dimensional structures of two cyanobacterial C-phycocyanins at 2.1 A and 2.5 A resolution, J. Mol. Biol., 196 (1987) 677-695.

Sherman, D. M., Troyan, T. A. and Sherman, L. A., Localization of Membrane Proteins in the Cyanobacterium *Synechococcus* sp. PCC7942 (Radial Asymmetry in the Photosynthetic Complexes), Plant Physiol., 106 (1994) 251-262.

Sherman, D.M. and Sherman, L.A., Effect of iron deficiency and iron restoration on ultrastructure of *Anacystis nidulans*, J. Bacteriol. 156 (1983) 393-401.

Shibata, M., Katoh, H., Sonoda, M., Ohkawa, H., Shimoyama, M., Fukuzawa, H., Kaplan, A., Ogawa, T., Genes essential to sodium-dependent bicarbonate transport in Cyanobacteria: Function and phylogenetic analysis, J. Biol. Chem., 277 (2002) 18658-18664.

Shibata, M., Ohkawa, H., Kaneko, T., Fukuzawa, H., Tabata, S., Kaplan, A., Ogawa, T., Distinct constitutive and low-CO_2-induced CO_2 uptake systems in cyanobacteria: genes involved and their phylogenetic relationship with homologous genes in other organisms, Proc. Natl Acad. Sci. USA, 98 (2001) 11789-11794.

Sidler, W. A., Phycobilisome and phycobiliprotein structures. In: Bryant, D. A. (ed.) Advances in Photosynthesis. Vol. 1: The Molecular Biology of Cyanobacteria, Kluwer Academic Publishers, Dordrecht, Boston, London, (1994) 139-216.

Singh, A.K., Li, H. and Sherman, A., Microarray analysis and redox control of gene expression in the cyanobacterium *Synechocystis* sp. PCC 6803, Physiol. Plant., 120 (2004) 27-35.

Singh, A.K., Li, H., Bono, L., Sherman, L.A., Novel adaptive responses revealed by transcription profiling of a *Synechocystis* sp. PCC 6803 delta-isiA mutant in the presence and absence of hydrogen peroxide, Photosynth. Res., 84 (2005) 65-70.

Singh, A.K., McIntyre, L.M. and Sherman, L.A., Microarray analysis of the genome-wide response to iron deficiency and iron reconstitution in the cyanobacterium *Synechocystis* sp. PCC 6803, Plant Physiol., 132 (2003) 1825-1839.

Singh, A.K., Sherman, L.A., Iron-independent dynamics of IsiA production during the transition to stationary phase in the cyanobacterium *Synechocystis* sp. PCC 6803, FEMS Microbiol. Lett., 256 (2006) 159-164.

Specht, S., Kuhlmann, M., Pistorius, E., Further investigations on structural and catalytic properties of O_2 evolving preparations from tobacco and two chlorophyll deficient tabacco mutants, Photosynth. Res., 24 (1989) 15-26.

Stauber, E.J., Fink, A., Markert, C., Kruse, O., Johanningmeier, U. and Hippler, M., Proteomics of Chlamydomonas reinhardtii light-harvesting proteins, Eukaryot Cell, 2 (2003) 978-94.

Straus, N. A., Iron deprivation: Physiology and gene regulation. In: Bryant, D. A. (ed.) Advances in Photosynthesis. Vol. 1: The Molecular Biology of Cyanobacteria, Kluwer Academic Publishers, Dordrecht, Boston, London, (1994) 731-50.

Sunderhaus, S., Dudkina, N., Jänsch, L., Klodmann, J., Heinemeyer, J., Perales, M., Zabaleta, E., Boekema, E.J., and Braun, H.P., Carbonic anhydrase subunits form a matrix-exposed domain attached to the membrane arm of mitochondrial complex I in plants, J. Biol. Chem., 281 (2006) 6482-6488.

Tamagnini, P., Axelsson, R., Lindberg, P., Oxelfelt, F., Wünschiers, R., Lindblad, P., Hydrogenases and hydrogen metabolism of cyanobacteria, Microbiol. Mol. Biol. Rev., 66 (2002) 1-20.

Thomas, J.C., Ughy, B., Lagoutte, B., Ajlani, G., A second isoform of the ferredoxin:NADP oxidoreductase generated by an in-frame initiation of translation, PNAS, 28;103 (48) (2006)18368-73.

Tölle, J., Michel, K.P., Kruip, J., Kahmann, U., Preisfeld, A., Pistorius, E.K., Localization and function of the IdiA homologue Slr1295 in the cyanobacterium *Synechocystis* sp. strain PCC 6803, Microbiology, 148 (2002) 3293-3305.

Ughy, B., Ajlani, G., Phycobilisome rod mutants in *Synechocystis* sp. strain PCC6803, Microbiology, 150(12) (2004) 4147-56.

Van den Hoek, C., Mann, D. G. and Jahns, H. M., Cyanophyta (= Cyanobacteria). In: Van den Hoek, C., Mann, D.G. & Jahns, H.M. (eds.) Algae: An Introduction to Phycology, Cambridge University Press, (1995) 16-41.

Van Heel, M., Similarity measures between images, Ultramicroscopy, 21 (1987) 95-100.

Van Heel, M., Gowen, B., Matadeen, R., Orlova, E.V., Finn, R., Pape, T., Cohen, D., Stark, H., Schmidt, R., Schatz, M. and Patwardhan, A., Single-particle electron

cryo-microscopy: towards atomic resolution, Quat. Rev. Biophys., 33 (2000) 307-369.

Van Thor, J.J., Jeanjean R., Havaux M., Sjollema K.A., Joset F., Hellingwerf K.J., Matthijs H.C., Salt shock-inducible photosystem I cyclic electron transfer in Synechocystis PCC6803 relies on binding of ferredoxin:NADP(+) reductase to the thylakoid membranes via its CpcD phycobilisome-linker homologous N-terminal domain, Biochim. Biophys. Acta, 1457 (2000) 129–144.

Van Thor, J.J., Gruters, O.W.M., Matthijs, H.C.P., Hellingwerf, K.J., Localization and function of ferredoxin:NADP(+) reductase bound to the phycobilisomes of *Synechocystis*, EMBO J., 18 (1999) 4128-4136.

Vinnemeier, J., Kunert, A., Hagemann, M., Transcriptional analysis of the isiAB operon in salt-stressed cells of the cyanobacterium *Synechocystis* sp. PCC 6803, FEMS Microbiol. Lett., 169 (1998) 323-330.

Volokita, M., Zenvirth, D., Kaplan, A., Reinhold, L., Nature of the inorganic carbon species actively taken up by the cyanobacterium Anabena-variabilis, Plant. Physiol., 76 (1984) 599-602.

Xu, W., Tang, H., Wang, Y. and Chitnis, P.R., Proteins of the cyanobacterial photosystem I, Biochim. Biophys. Acta, 1507 (2001) 32-40.

Yagi, T. and Matsuno-Yagi, A., The proton-translocating NADH-Quinone oxidoreductase in the respiratory chain: the secret unlocked, Biochemistry, 42 (2003) 2266-2274.

Yamanaka, G., Glazer, A. N. & Williams, R. C., Molecular architecture of a light-harvesting antenna. Comparison of wild type and mutant *Synechococcus 6301* Phycobilisomes, J. Biol. Chem., 255 (1980) 11004-11010.

Yeremenko, N., Kouril, R., Ihalainen, J.A., D'Haene, S., van Oosterwijk, N., Andrizhiyevskaya, E.G., Keegstra, W., Dekker, H.L., Hagemann, M., Boekema, E.J., Matthijs, H.C.P. and Dekker, J.P., Supramolecular organization and dual function of the IsiA chlorophyll-binding protein in cyanobacteria, Biochemistry, 43 (2004) 10308-10313.

Yi, Z.W., Huang, H., Kuang, T.Y., Sui, S.F., Three-dimensional architecture of phycobilisomes from *Nostoc flagelliforme* revealed by single particle electron microscopy, FEBS Lett., 579 (2005) 3569-3573.

Yousef, N., Pistorius, E.K. and Michel, K.P,. Comparative analysis of idiA and isiA transcription under iron starvation and oxidative stress in Synechococcus elongatus PCC 7942 wild-type and selected mutants, Arch. Microbiol., 180 (2003) 471-483.

Zhang, P., Battchikova, N., Jansen, T., Appel, J., Ogawa, T., Aro, E.-M., Expression and Functional Roles of the Two Distinct NDH-1 Complexes and the Carbon Acquisition Complex NdhD3/ NdhF3/CupA/Sll1735 in *Synechocystis* sp PCC 6803, The Plant Cell ,16 (2004) 3326-3340.

Zhang, P., Battchikova, N., Paakkarinen, V., Katoh, H., Iwai, M., Ikeuchi, M., Pakrasi, H. B., Ogawa, T. and Aro, E.-M. Isolation, subunit composition and interaction of the NDH-1 complexes from *Thermosynechococcus elongatus* BP-1, Biochem. J, 390 (2005) 513-520.

Zouni, A., Witt, H.T., Kern, J., Fromme, P., Krauss, N., Saenger, W., Orth, P., Crystal structure of photosystem II from Synechococcus elongatus at 3.8 angstrom resolution, Nature, 409 (2001) 739-743.

Wehrmeyer, W., Organization and composition of cyanobacterial and rhodophycean phycobilisomes. In Photosynthetic Prokaryotes. Cell differentiation and Function (Papageorgiou, G. C. & Packer, L., eds), (1983) 1-22, Elsevier Biomedical, New York.

Wehrmeyer, W., Phycobilisomes: structures and function. In Experimental Phycology: Cell Walls and Surfaces, Reproduction, Photosynthesis (Wissner, W., Robinson, D. G. & Star, R. C., eds), (1990) 158-172, Springer Verlag, Berlin.

Williams, R. C., Gingrich, J. C. & Glazer, A. N., Cyanobacterial phycobilisomes: particles from *Synechocystis 6701* and two pigment mutants, J. Cell Biol., 85 (1980) 558-566.